Fabrication of three-dimensional porous Cu current collector for lithium-ion batteries using Space Holder Method

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The novel three-dimensional (3D) porous copper was constructed by space holder method based on powder metallurgy technique, which was used as the current collector to develop the high-capacity Sn anode with 3D porous architecture for the lithium-ion batteries. The influences of the porosity of 3D porous copper on the specific capacity and cyclic stability of the Sn anode for lithium-ion batteries were investigated systematically. The results show that the 3D porous Sn-Cu electrode could exhibit relatively higher specific capacity and better cyclic stability compared to the Sn coated Cu foil electrode, and the 3D porous Sn-Cu electrode could maintain better structural integrity after 100 cycles. Especially, when using the copper current collector with porosity of 74.78% to construct the 3D porous Sn-Cu electrode, and the initial specific capacity and coulomb efficiency of electrode could achieve 612.1mAh/g and 71.75%, respectively. Also, it could maintain highest capacity retention ratio of 35.04% after 100 cycles. As a result, this 3D porous copper current collector constructed with space holder method based on powder metallurgy technique could provide an optional approach to improve lithium-ion batteries.

Keywords: Three-dimensional porous Cu; Space holder method; Current collector; Lithium-ion battery

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